PART 5 - STORM SEWERS

INDEX

1. GENERAL

A. This part of the Specifications includes material and installation procedures for construction of storm sewers and appurtenances.

2. PIPE MATERIAL AND JOINTS

A. Reinforced concrete pipe (RCP): ASTM C 76, minimum class III, Wall B, tongue and groove joints, machined ends; use for storm sewers.

1. Reinforced concrete pipe joints: use cold applied bituminous jointing material: Sewertite, Gibson-Homans, or equal.

2. Apply joint material to bottom one-half (½) of groove and top one-half (½) of matching tongue in sufficient quantity to fill jointing; force adjoining pipe together.

3. Fill al remaining voids in joints both inside and outside of pipe; trowel inside of pipe twenty-four inches (24") and larger; wipe interior joint clean in pipes smaller than twenty-four inches (24").

4. Reinforced concrete flared end section: construct with reinforcing steel and concrete in accordance with ASTM C 76; strength not less than adjoining pipe sections; use where shown on plans; comply with Standard Drawings.

B. Plastic pipe, use for sump pump drain lines and subdrains:

1. Polyvinyl chloride pipe (PVC): ASTM D 3034, SDR 35, PVC plastic in accordance with ASTM D 1784, Cell Classification 12454-B; joints according to manufacturer's recommendation; use for sump pump and subdrain lines.

2. Polyvinyl chloride (PVC) corrugated pipe: ASTM F 949; PVC plastic in accordance with ASTM D 1784, Cell Classification 12454-B; joints according to manufacturer's recommendation; use for sump pump and subdrain lines and for perforated and non-perforated subdrain lines.

3. Polyvinyl chloride composite pie (PVCT) truss pipe: Semi-rigid composite pipe, ASTM D 2680, joins according to manufacturer's recommendations; use for sump pump collector lines and non-perforated subdrain lines.

4. High Density Polyethylene (HDPE) corrugated pipe: ASTM F 405; HDPE plastic in accordance with ASTM D 1248, Type III, Category 4 or 5, Grade P 33 or P 35, Class C; use for sump pump drain lines and subdrains.

5. Install manufacturer recommended tees or wyes at all sump pump collector lines for services.
6. Install manufacturer's recommended tees or wyes at all connections between non-perforated subdrains/sump pump collector lines and perforated subdrains.

3. MANHOLES

A. Construct manholes and end of line cleanouts (sump pump drain lines and subdrains only for cleanouts) in accordance with Standard Drawings.

B. Construct base and top slab of reinforced concrete as specified; precast top.

C. Construct walls of precast reinforced concrete manhole sections conforming to ASTM C 478, five inch (5") minimum wall thickness, diameter as shown on plans.

D. Type E Casting: use outside paved areas.

E. Type F Casting: use in paved areas; use Type C checkered top lid.

F. Type H Casting; use for end of line clean out for sump pump drain lines and subdrains only.

G. Provide concrete adjusting rings on manholes to place cover at finished grade or required elevation; provide at least two (2) adjusting rings; maximum height of adjusting rings: twelve inch (12"); bed each ring in cold applied bituminous jointing compound.

H. Manholes and casting shall be suitable for AASHTO HS-20 Highway loadings.

I. Securely bolt castings to intakes and precast manhole sections with a minimum of 2-1/2" bolts.

4. CURB INTAKES

A. Construct in accordance with Standard Drawings.

B. Construct base and top slab of reinforced concrete as specified.

C. Construct walls of solid precast concrete block, ASTM C 139 and cement mortar or cast in place concrete.

D. Mortar: one part portland cement to two parts mortar sand; hydrated lime, five pounds (5 lbs.) Per sack of cement may be added for workability.

E. Completely fill joints with mortar for watertight structure; tool each joint.

F. Install horizontal masonry wall reinforcement in each bed joint of wall; reinforcement; nine (9) gauge side and cross rods.

G. Thoroughly cover inside and outside of walls with Block Bond or equal.

H. In freezing weather, heat materials and protect work from cold; maintain temperature of work at forty degrees Fahrenheit (40° F.) For at least twenty four (24) hours after placing.

I. Intake castings: Shall be as specified or as shown on Standard Drawings or Plans.

1. Type R Casting: use for Type M-A, M-C, M-D, and M-E curb intakes unless otherwise specified.

2. Type Q Casting: use for Type M-A and M-C driveway intakes unless otherwise specified.

3. Type E Casting: use for Type M-C and M-E intakes unless otherwise specified.

4. Type G Casting: use for Type M-G intake only.

5. STORM SEWER INSTALLATION

A. Provide bedding and backfill as shown on Standard Drawings and as specified in EXCAVATIONS AND BACKFILL FOR PIPES AND STRUCTURES.

B. Before laying pipe, verify all measurements at sire; make necessary field measurements to accurately determine sewer makeup length or closures.

C. Begin at lowest point in line; lay groove ends pointing upstream.

D. Visually inspect pipe for defects before carefully lowering into trench; lay true to line and grade; provide for uniform bearing of the pipe barrel on the trench bottom.

E. Provide smooth and uniform invert; bear tongue against groove shoulders.

F. Make joints with equipment recommended by pipe manufacturer, do not use backhoe to push joints together.

G. Keep pipe free of all dirt and foreign material.

H. Saw cut end of pipe at manholes and intakes; do not hammer, cut, or break pipe.

I. Line and grade:

1. Use laser light equipment or batter boards for line and grade control.

   a. Use detection equipment to monitor laser light to prevent movement or drift of line from line and grade.

   b. Use minimum of three (3) batter boards not more than twenty five feet (25') apart.

2. Check line and grade of each pipe length; horizontal and vertical alignment of the installed pipe shall not vary more than plus or minus one-fourth inch (1/4").

3. Check sewer grade at maximum one hundred foot (100') intervals with level and level rod.

4. Continuously check alignment of sewer by flashing light between manholes or between last piece of pipe laid opening at downstream manhole.

5. Correct misalignment, displacement, or otherwise defective sewer.

6. CONFLICT WITH EXISTING UTILITIES

A. Provide temporary support for existing water, gas, telephone, power, and other utility services that cross trench until backfilling of the trench has been completed.

B. Compact backfill under existing utility crossing to ninety-five percent (95%) maximum density; moisture content not less than two percent (2%) below optimum or more than three percent (3%) above optimum moisture content.

7. CONNECTION BETWEEN DISSIMILAR GRAVITY PIPE.

A. Use manufactured special adaptors or couplings whenever possible.

B. If coupling not available, use concrete collar six inches (6") thick and twelve inches (12") each way from joint; reinforce with 6"x6"-W2.9 x W2.9 welded wire fabric.

8. SUMP PUMP DRAIN LINES

A. Provide adequately sized storm sewers or sump pump drain lines to receive discharge from foundation drains or sump pumps.

2. Install sump pump drain lines with a minimum of forty-two inches (42") cover.

3. Install pipe, manholes, and/or end of line cleanouts as specified for STORM SEWERS.

4. Provide water tight sump pump service connections to sump pump collector lines or storm sewer for each platted lot or building; extend service line from storm sewer to one foot (1') beyond property line.

5. Place watertight stopper or plug in end of service line.

6. Mark locations of sump pump service connection with steel post painted yellow.

9. SUBDRAINS

1. Construct perforated and/or non-perforated subdrains as shown on plans.

2. Install subdrains with a minimum of forty-two inch (42") cover with perforations down.

3. Slope subdrains to drain.

4. Backfill perforated subdrain with washed, round, durable, porous backfill material approximately 3/8" in size, commonly known as pea gravel.

5. Connect subdrains to storm sewer, sump pump collector lines or daylight in drainage way.

6. Install pipe, manholes, and/or end of line cleanouts as specified for storm sewers.

10. RIP RAP

A. IDOT 4130, class E Revetment with following gradation:

Stone Size	% Larger Than
250 pounds	0
90 pounds	50-100
5 pounds	90-100
½" sieve	95-100

B. Sound and durable broken limestone, dolomite or quartzite, maximum abrasion loss: fifty percent (50%) in accordance with AASHTO T96; broken concrete or rubble not acceptable.

C. Place on four inch (4") thick stone filter or engineering fabric; stone filter material; pipe bedding as specified in EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES; engineering fabric: IDOT 4196.

PART 6 - CONCRETE AND REINFORCING STEEL

INDEX

1. GENERAL

A. This part of the Specifications details requirements for portland cement concrete and reinforcing steel used in the construction of utility structures.

2. CONCRETE MATERIALS

A. Portland cement: ASTM C 150, Type I.

1. Keep clean, dry, and free from weather damage and contamination.

B. Aggregates: strong, durable, uniformly graded mineral grains conforming with IDOT 4110 and 4115 for structural concrete.

1. Stockpile each gradation separately on clean, noncontaminating surfaces.

C. Water: clean and free from injurious materials.

D. Admixtures:

1. Plasticizing material: Pozzolith by Master Builders Company, or approved equal; maintain cement content specified.

2. Non-shrink: Embeco by Master Builders Company, or approved equal.

3. CONCRETE QUALITY

A. Mix Design: IDOT 2403.03, Class C or Class M, 4000 psi minimum strength.

B. Water-cement ratio: 0.488 lb. of water per lb. of cement, maximum, including free moisture in aggregates.

C. Slump: Maintain between two and one half inches (2-1/2") to four inches (4").

D. Air content: Maintain between five percent (5.0%) to eight per cent (8.0%).

E. Admixtures: per manufacturer's recommendations.

F. Concrete mix: meet approval of City.

4. FORMS

A. Form all concrete, unless permitted otherwise by City.

B. Use metal or plywood-lined forms for exposed surfaces; erect true to line and grade; brace and tie securely.

C. Coat forms with non-staining mineral oil before placing reinforcing.

D. Strip forms only after concrete has cured for at least twenty-four (24) hours and has developed sufficient strength to withstand subsequent stress.

5. MIXING, PLACING, PROTECTING, AND CURING

A. Provide accurate control for measuring materials.

B. Mix until mass is homogeneous and uniform in color.

C. Ready-mixed concrete: conform with specifications and ASTM C 94.

D. Clean and dampen forms, reinforcing steel and embedded items; thoroughly compact by tamping or vibrating.

E. Prevent segregation during placing; do not drop concrete more than three feet (3').

F. Place concrete continuously in each section until complete; permit not more than thirty (30) minutes between depositing adjacent layers of concrete within each section.

G. Thoroughly compact, puddle, and vibrate concrete into corners and around reinforcing and embedded items.

H. Place sections of concrete in a sequence which eliminates the effect of shrinkage to greatest extent practicable.

I. Immediately after finishing or stripping forms, apply continuous cover of polyethylene film, IDOT 4106; minimum lap: six inches (6"); keep film in place for seven (7) days.

J. Alternate to polyethylene film, cure using white-pigmented liquid curing compound after end of bleeding in accordance with IDOT 2403.10.

K. Maintain concrete temperature between sixty degrees (60°) and ninety degrees (90°) when placing and not less than fifty degrees (50°) for seventy-two (72) hours after placing.

L. Place concrete footings and slabs only on subgrades capable of supporting anticipated loads.

6. FINISHING

A. Patching:

1. Chip out honeycomb to sound concrete. Patch immediately after removing forms and inspection by City.

2. Fill holes with patching mortar consisting of one (1) part portland cement and three (3) parts sand.

3. Fill holes left by form ties with non-shrink grout to within one inch (1") of surface; fill remainder with patching mortar.

4. Where existing concrete has been removed, patch uneven surfaces with patching mortar.

B. Surfaces: float to uniform finish with cork float; use edger on exposed edges.

C. Chamfer corners.

7. REINFORCING STEEL

A. Billet steel bars: ASTM A 615, Grade 40.

B. Bend cold to conform with required details; bend bars in fabricating shop before delivery to site.

C. Space properly and tie securely in position before placing concrete; tie with minimum No. 18 tie wires or as permitted by city.

D. Lap bars 36 diameters, unless noted otherwise on plans.

E. Remove scale, dirt, or other coatings which may impair bond; comply with ACI 318.

F. Install reinforcing steel in position with preformed wire bar bolsters and spacers.

G. Place concrete only after reinforcing system is in place and approved by City; install reinforcing system plumb and true; tie securely; reinforcing must remain in proper position without distortion or displacement of individual bars or system during pour.

8. WIRE FABRIC

A. Electrically welded wire fabric: ASTM A 185 and A 82.

B. Size and mesh: as shown.

C. Place securely as shown or as directed by City.

D. Lap fabric not less than six inches (6").

E. Remove scale, dirt, and other bond-impairing materials.

9. RESTRICTIONS ON OPERATIONS

A. Weather:

1. Do not place concrete when stormy or inclement weather or temperature prevents good workmanship.

2. Use no aggregates containing frozen lumps and do not place concrete on frozen foundation.

3. With weather conditions, begin concrete mixing and placement when ambient temperature is at least thirty-four degrees Fahrenheit (34° F.) and rising.

4. Concrete delivered to site must have temperature of at least forty degrees Fahrenheit (40° F.).

5. Stop concrete mixing and placement when ambient temperature is thirty eight degrees Fahrenheit (38° F.) and falling.

6. Stop concrete mixing and placement when ambient temperature exceeds ninety-five degrees Fahrenheit (95° F.).

PART 7 - PORTLAND CEMENT CONCRETE PAVEMENT

INDEX

1. GENERAL

A. This part of the Specifications includes construction of portland cement concrete pavement with integral curb, and curb and gutter on prepared subgrade using preset forms or slip forms methods.

B. This part of the Specifications includes deformed tie bars and reinforcement dowels for joints and deformed reinforcement bars for pavement reinforcement.

C. This part of the Specifications includes construction of concrete driveways and sidewalk.

2. MATERIALS

A. Portland cement: ASTM C 150, Type I.

B. Admixtures:

1. Air entraining: ASTM C 260.

2. Retarding: a suitable retarding admixture may be used during hot weather, with approval of City.

3. Calcium chloride shall not be used.

4. Fly ash : ASTM C 618; IDOT 4108 (Type C Mixes only).

5. Water Reducing Agents: ASTM C 494; IDOT IM 529.

6. Other admixtures may be used subject to approval of City.

C. Fine aggregate: IDOT 4110.

D. Coarse aggregate:

1. Clean, hard, durable particles of crushed limestone free from injurious amounts of objectionable materials; minimum Class 2 durability limestone; IDOT 4115.

2. Gradation: IDOT 4115, Gradation Number 5.

E. Water: clean and clear, free from salt, oil, acid, strong alkalis, vegetable matter, or other substances injurious to concrete.

F. Reinforcing steel:

1. Deformed bars: ASTM A 615, Grade 40.

2. Plain and smooth dowel bars: ASTM A 615; Grade 40.

3. Epoxy coated reinforcement: AASHTO M 284 and IDOT 4151.03B, use on all plain and smooth dowel bars and as shown on Plans.

G. Expansion tubes:

1. Fabricated steel or plastic tubes; provide tubes with internal diameter one-sixteenth inch (1/16") larger than dowel bar; bar stop capable of withstanding twenty pounds (20 lbs.) push, minimum.

H. Metal keyways:

1. Fabricated twenty-four (24) gauge sheet steel; conform to details shown on plans; provide lengths in multiples of tie bar spacing; punch to receive tie bars; support metal keyway with legs unless installed by paving machine.

I. Supports for reinforcing steel:

1. Support tie bars as required to place and maintain correct location during construction.

2. Support dowel bars at expansion and contraction joints as shown on Standard Drawings.

3. Epoxy coated reinforcement: support with metal chairs and supports coated with epoxy or other inert material reviewed by Engineer; tie with plastic coated tie wires.

J. Joints

1. Joint sealer: hot poured joint filler composed of petropolymers, ASTM D 3405 with ninety (90)-one hundred and fifty (150) penetration at seventy-seven degrees Fahrenheit (77° F.) and passing three (3) cycles, two hundred per cent (200%) extension bond test at minus twenty degrees Fahrenheit (-20° F.).

2. Backer rope: cellulose or plastic foam suitable for use with hot-poured sealer; size and compression such that it maintains position during filling operation.

3. Preformed expansion joint filler: asphalt saturated fiber strips; AASHTO M213; furnish in strips of plan dimensions.

K. Liquid curing compound: IDOT 4105.

1. Use white curing compounds on all pavements not receiving ACC overlay.

2. Use dark colored compounds an all pavements receiving ACC overlay.

L. Plastic film: opaque, white pigmented polyethylene plastic, 0.00085" minimum thickness, use only once if less than 0.0034" thick.

3. PROPORTIONS FOR MIX

A. Mix No. C-3 or C-4 in accordance with IDOT 2301.04.

1. Air entraining admixture: produce 6.5% $\pm$ 1.5% air voids in fresh concrete measured by pressure method.

2. Water reducing admixture: furnish at contractor's option; IDOT IM 529.

3. Fly Ash: furnish at contractor's option; Type C or Type F Fly Ash; IDOT IM 529; use in accordance of IDOT 2301.04E.

B. Mix No. M-4 in accordance with IDOT 2301.04E; use as directed by City Engineer.

1. Air entraining admixture: produce 6.5% $\pm$ 1.5% air voids in fresh concrete measured by pressure method.

C. Proportion of adjustments:

1. Basis: when actual quantity of concrete is more than one hundred and one per cent (101%) or less than ninety-nine per cent (99%) of calculated quantity or if combination of materials does not produce quality of concrete specified.

2. Fine aggregate shall not exceed fifty per cent (50%) of total aggregate in any adjustment.

3. Do not exceed maximum water-cement ratio specified.

D. Water quality and concrete consistency:

1. Use proper amount of mixing water to produce concrete of uniform consistency; adapt to mix, characteristics of materials used, methods of consolidation, weather conditions and slope of finished surface.

2. Modify proportion if maximum water-cement ratio does not produce workability; increase cement to aggregate proportion to produce specified degree of workability without exceeding maximum water-cement ratio.

E. Tests on trial batches and concrete placed at project site:

1. Slump: ASTM C 143; one and one-half inch (1-1/2") to three inches (3") for machine finished concrete; four inches (4") maximum, for hand finished concrete.

2. Air voids of fresh concrete, by pressure method: ASTM C 231; 6.5% $\pm$ 1.5%.

3. Minimum compressive strength: ASTM C 39; 2,750 psi when tested at seven (7) days and 4,000 psi when tested at twenty eight (28) days.

4. STORAGE AND PROTECTION OF MATERIALS

A. Aggregates: store and handle aggregates to avoid contamination and frequent variations in specific gravity, gradation or moisture content of materials used.

1. Store fine and course aggregates in separate piles or bins.

2. Minimize changes in aggregates with different specific gravities or gradations in working day.

3. Handle aggregates to prevent variations of more than one-half percent (0.5%) in moisture content of successive batches.

4. Thoroughly wet and allow to drain for at least one (1) hour course aggregate having an absorption greater than one-half percent (0.5%).

5. Drain fine aggregate at least twenty-four (24) hours after washing and before batching.

B. Cement: store in suitable weathertight enclosures and handle to prevent loss.

1. If lumps develop in cement, cement must be reprocessed, retested, and reapproved prior to use.

2. Cement in storage at site or local warehouses for more than sixty (60) days must be retested prior to use.

C. Admixtures: store in suitable weathertight enclosures which will preserve quality.

D. Reinforcing steel: store off ground on timbers or other supports.

5. CONCRETE PROPORTIONING AND MIXING EQUIPMENT

A. Plant batching and mixing equipment shall be IDOT calibrated and approved. Provide copy of current certification.

B. Equipment may be either stationary central plant mixer or central plant-proportioned with truck mounted transit mixer.

C. If concrete is central mixed, it may be transported in agitating or non-agitating units.

1. Concrete must be placed on grade within thirty (30) minutes after mixing if transported in non-agitating units.

2. Concrete must be placed on grade within ninety (90) minutes after mixing if transported in agitating units.

D. When concrete is mixed on truck mounted transit mixers and agitated thereafter, concrete must be handled in accordance with IDOT 2301.13.D.2.

E. Truck Mounted Transit Mixers: capacities and mixing capability as defined in ASTM C 94 with attached plate containing required information.

1. Equipment shall include reliable reset-revolution counter which will register the number of revolutions at mixing speed.

2. Unit must have signed certifications that concrete producer or authorized representative has inspected unit within previous thirty (30) day period and that interior of mixing drum is clean and reasonably free of hardened concrete, that fins or paddles are not broken or worn excessively, and that other parts are in proper working order.

F. Plant or transit mixers must produce concrete with consistent quality; if uniformity, entrained air or slump varies, concrete producer must take corrective action.

G. Each truck load of concrete must be identified by an acceptable plant charge ticket showing plant name, Contractor, project name, date, quantity, class, time batched, and water added at site.

6. PLACEMENT EQUIPMENT

A. Subgrade finishing equipment: use mechanical excavating equipment designed for this purpose, approved by City.

1. Form line or path area for slip-form paving machine shall be constructed to final grade by form-line excavating equipment with automatic grade controls.

2. Subgrade between forms or between path areas for slip-form machines constructed to final grade with steel shod template or automatically controlled subgrade excavating machine.

B. Side forms: steel, minimum thickness: five (5) gauge, height at least equal to design thickness of pavement, base width at least six inches (6").

1. Minimum section length: ten feet (10'), joint connections designed to permit horizontal and vertical adjustment with locking device to hold abutting sections firmly in alignment when set.

2. Bracing, support, and staking must prevent deflection or movement of forms from pressure of concrete or weight or thrust of machinery operating on forms.

3. Forms must be free from scale and surface irregularities; coat with form oil prior to concrete placement.

C. Flexible forms: use steel or wood flexible forms for curves with radius less than one hundred feet (100').

1. Bracing, support, and staking must prevent deflection or movement of forms from pressure of concrete or weight or thrust of machinery operating on forms.

2. Forms used to form back of curbs at returns shall have height at least equal to design thickness of pavement and curb height.

3. Forms must be free from scale and surface irregularities; coat with form oil prior to concrete placement.

D. Consolidating and finishing equipment: fixed form or slip form paving machines specifically designed for placing, striking off, consolidating, and finishing in single passage to required cross section.

1. Consolidation of concrete by single pass of approved surface, tube or internal vibrator operated in accordance with manufacturer's recommendations.

2. Slip form equipment: automatic horizontal and vertical controls required; equipment must spread concrete to uniform depth prior to striking off.

3. Air screeds and vibrating screeds are approved consolidating and finishing equipment for cul-de-sacs and drives only.

4. Equipment subject to approval of City.

E. Hand finishing equipment: Contractor shall provide tools including wood or magnesium floats, wood hand floats, pointing trowels, edgers, or other equipment necessary for proper finishing of concrete.

1. Provide two (2) light straightedges, ten feet (10') long, with handles not less than twelve feet (12') long for use in detecting irregularities in surface; provide two (2) heavy straightedges of similar size for use in correcting surface; provide two (2) light straightedges six feet (6') long for checking curb and gutter line.

2. Provide approved vibrators for consolidating concrete.

3. Provide metal or wood screed true to crown.

F. Curing equipment: use pressure sprayer capable of applying a continuous uniform film of curing compound.

G. Concrete saws: power operated concrete saws capable of cutting hardened concrete neatly.

H. Joint sealing equipment: equipment capable of heating and installing sealant in joints in accordance with manufacturer's recommendations.

PART 7 - PORTLAND CEMENT CONCRETE PAVEMENT

7. PAVEMENT CONSTRUCTION

A. General:

1. Place, strike off, consolidate, and finish concrete with fixed form or slip form mechanical paving equipment to cross section shown on plans.

2. Use paving machine for all uniform width slabs eight and one-half feet (8 ½') or more in width and two hundred feet (200') or more in length.

3. Use hand placing, consolidating, and finishing in areas of irregular dimensions or narrow widths.

4. Set paving stakes at twenty-five feet (25') maximum spacing on curves, fifty feet (50') maximum spacing on tangents.

B. Setting and removing forms:

1. Use form line excavating machine to establish subgrade for forms used to support mechanical subgrader, mechanical spreader or finisher, or other similar equipment.

2. Set base of forms at or below subgrade elevation with top of forms at pavement surface elevation at edge of slab.

3. Extra height forms may be used to back up integral curb; set base at or below subgrade elevation with top of form at top of curb elevation.

4. Set forms accurately to required grade and alignment and secure in place to maintain grade and alignment during concrete placement and finishing.

5. If voids occur under forms, remove forms and rework subgrade to proper elevation and density.

6. If soil supporting form is softened by rain or standing water so that form is inadequately supported, remove forms and rework subgrade to proper elevation and density.

7. Check form joints with ten foot (10') straightedge prior to paving; adjust as necessary to proper grade and alignment; maximum deviation of top surface is one-fourth inch (1/4") in ten feet (10').

8. Coat forms with form oil before concrete is placed to prevent adherence to concrete.

9. Leave side forms in place not less than six (6) hours after concrete is placed; if form removal damages concrete, City may require remaining forms to remain in place more than six (6) hours.

10. Remove forms with care to prevent cracking, spalling, or overstressing concrete; remove form stakes prior to raising forms.

11. Clean forms before resetting.

C. Concrete and steel placement:

1. Uniformly moisten subgrade just prior to concrete placement or place plastic film on prepared subgrade, lap joints twelve inches (12").

2. Adjust manhole castings, valve boxes, or other fixtures within pavement to finished surface grade; clean outside of castings.

3. Place dowel and tie bars as shown on Standard Drawings or specified; support and secure bars by approved chairs and wire assemblies. Place steel centered in the pavement a minimum of three hundred feet (300') ahead of paving operation.

4. Place concrete to full depth in single operation; do not pile concrete more than eight inches (8") above design elevation of surface.

5. Carefully place concrete on subgrade to prevent segregation of materials and at locations which require minimum rehandling; do not displace reinforcing.

6. Vibrate and consolidate to prevent formation of voids; do not displace reinforcing.

D. Finishing:

1. Begin finishing operations promptly after concrete has been placed and consolidated.

2. Screed surface to grade and crown as shown on plans.

3. Do not add free water to surface.

4. Finish surface with wood or magnesium floats; finish from both sides simultaneously if pavement is placed to full width with one pass of paving machine.

5. Check surface longitudinally with ten feet (10') long straightedge while concrete is still plastic; correct any surface deviations greater than one-eighth inch (1/8") in ten feet (10').

6. Provide uniformly gritty surface with astroturf drag; round edges of pavement to one-eighth inch (1/8") radius.

7. Check pavement surface longitudinally after concrete has hardened with ten feet (10') long straightedge; grind high spots over one-eighth inch (1/8") with approved grinding device or device consisting of multiple saw blades.

E. Curb and gutter and integral curb:

1. Construct curb and gutter and integral curb, as shown on Standard Drawings, along with pavement or immediately following finishing or pavement.

2. Use paving machine with integral slip-form for curb; curb mule or similar mechanical equipment providing equivalent results.

3. Construct depressed curb at driveways and where sidewalk intersect street; use templates to form faces of such curbs.

4. Form and construct curb by hand only where barrier or depressed curb is required and where small radii or other special sections preclude use of mechanical equipment.

5. Construct curb as rapidly as finishing operations on pavement permit; maximum distance behind paving machine: one hundred feet (100').

6. Remove free water, laitance, dust, leaves, or other foreign matter prior to placing concrete for curb.

7. Use freshly mixed concrete; do not store concrete in receptacles at side of pavement for use in curb at a later time; do not use concrete requiring retempering.

8. Vibrate or puddle concrete to secure bond with paving slab and eliminate rock pockets.

9. Secure final finish on curbs by hand method, including six foot (6') straightedge or six foot (6') slipform.

10. Edge, protect, and cure curb in same manner as pavement.

11. Check surfaces of curb and gutter with ten foot (10') straightedge; correct variations greater than one-eighth inch (1/8"); remove and replace curbs having varying cross section.

F. Joints:

1. Round edges of concrete adjacent to header boards and preformed joint material to one eighth inch (1/8") radius.

2. Provide supplemental vibration adjacent to header boards and preformed joint material as required.

3. Construct "CD" joint when delays caused by weather conditions, end of day's work, or when concrete placement is interrupted for thirty (30) minutes.

4. Construct double width expansion joint in curb over expansion joint in pavement.

8. CURING AND PROTECTION

A. Apply liquid curing compound in fine spray to form continuous, uniform film on surface and vertical edges of pavement and curbs immediately after bleeding stops.

B. Apply compound with power sprayer; rate of application not less than 0.067 gallon per square yard (fifteen (15) square yards per gallon); do not dilute compound.

C. Apply to pavement surface after finishing and after surface moisture has disappeared; apply to pavement edges within thirty (30) minutes after forms are removed.

D. Protect concrete pavement during cold weather for at least seventy-two (72) hours after placement as follows: (Forecast based on National Weather Service 3:00 p.m. forecast for overnight low.)

Forecast or Actual Temperature	Protection
35 to 32 F.	One layer of burlap.
31 to 25 F.	Two layers burlap or one layer plastic film on one layer burlap.
Below 25 F.	Six inch (6") layer of straw or hay on top of one layer plastic film. Protect straw or hay from disturbance with a second layer of plastic or burlap.

1. Burlap: AASHTO M182, Class 3.

2. Commercial insulation may be substituted for straw or hay, when approved by City.

3. Protect straw, hay, or insulation from disturbance by wind; leave in place for five (5) days, minimum, or until pavement is opened to traffic.

4. Lap plastic film eighteen inches (18") at junctions.

E. Provide cold weather protection as specified for temperature below twenty-five degrees Fahrenheit (25° F.) for all concrete.

F. Provide burlap, paper, or plastic film, and planks and stakes at or near job site to cover and protect fresh concrete and to construct temporary forms for protection against rain.

G. Contractor responsible for pavement protection against effects of weather; failure to properly protect pavement may result in removal and replacement of damaged pavement.

9. JOINTS

A. Saw cut transverse and longitudinal joints in pavement and integral curb as shown on plans.

B. Begin saw cutting as soon as concrete can be sawed without objectionable tearing of sawed edges; complete work within twenty four (24) hours after concrete is placed.

C. Saw cutting shall not be allowed from 10:00 p.m. to 7:00 a.m. without permission of City Engineer. Plan saw cutting operations accordingly. Maintain dust abatement control measures until saw cutting operation is completed.

D. Clean wet sawed joints by water blasting; clean dry sawed joints by air blasting. Resawing of joints may be required if joints are not cleaned adequately.

E. Do not seal joints until concrete is at least three (3) days old and only when pavement and air temperature is forty degrees Fahrenheit (40 F.) or higher.

F. Lightly sandblast joint surfaces and clean joint by air blasting as shown on Standard Drawings.

G. Place backer rope and seal as shown on Standard Drawings.

I. Seal all joints before pavement is opened to contractor's forces and general traffic.

10. RESTRICTIONS ON OPERATIONS

A. Weather:

1. Do not place concrete when stormy or inclement weather or temperature prevents good workmanship.

2. Use no aggregates containing frozen lumps and do not place concrete on frozen subgrade.

3. With favorable weather conditions, begin concrete mixing and placement when ambient temperature is at least thirty-four degrees Fahrenheit (34° F.) and rising or as directed by City Engineer.

4. Concrete delivered to subgrade must have temperature of at least forty degrees Fahrenheit (40° F.).

5. Stop concrete mixing and placement when ambient temperature is thirty-eight degrees Fahrenheit (38° F.) and falling or as directed by City Engineer.

6. Stop concrete mixing and placement when ambient temperature exceeds ninety-five degrees Fahrenheit (95° F.) or as directed by City Engineer.

7. Pavement damaged by inclement weather shall be removed and replaced.

B. Night operation:

1. Place no concrete when darkness prevents good workmanship in placing and finishing as determined by City Engineer.

2. Do not place or finish concrete under artificial light.

C. Use of pavement:

1. Time for opening pavement for use will be determined by results of tests on cylinders taken during concrete placement.

2. Pavement may be opened to Contractor's forces after seven (7) days for purpose of removing coverings and building shoulders or if tests of cylinders from section show compressive strength of three thousand (3,000) psi or higher.

3. Open pavement to general traffic when authorized by City Engineer.

4. Concrete placed in cold weather may require additional curing time, as directed by City Engineer; keep all vehicles off pavement until such curing time has been completed.

11. DEFECTS OR DEFICIENCIES

A. Pavement containing excessive cracks, fractures, spalls, or other defects shall be removed and replaced, or repaired, at no cost to City. Severity of defects and remedy, determined by City Engineer.

B. Pavement thickness: determined by random cores; one (1) four inch (4") diameter core taken for each section of approximately one thousand (1,000) square yards.

C. Restore core holes by tamping non shrink cement grout into hole and finish by texturing surface.

D. If the concrete cores taken are less than the specified thickness, remove and replace pavement at no cost to City. Deficient thickness pavement will not be accepted.

E. Area represented by each core is one-half (½) of distance to next core or to end of pavement.

F. Additional core samples may be made and measured at Contractor's expense to determine the extent and severity of pavement deficiency.

G. Finished pavements on arterial and major collector streets to have a smoothness of 30 inches per mile or less when measured by a profilograph in accordance with IDOT 2316.01.

12. DRIVEWAYS AND SIDEWALKS

A. Construct driveways and sidewalks as shown on Standard Drawings.

B. Construct drop curbs in existing pavements in general conformance with the Standard Drawings.

1. Mill or saw curb to create a smooth uniform surface for the approach.

2. Remove concrete curb and gutter section and replace with depressed curb in accordance with Standard Drawings.

3. Should the result of construction not be acceptable, construct remedial action as directed by the City Engineer.

C. Use concrete with air entrainment and other materials as specified for CONCRETE PAVEMENT.

D. Forms: use wood or steel forms adequately staked and braced to maintain grade and alignment while concrete is placed and finished.

1. Set base of forms at or below subgrade elevation with top of forms at surface elevation at edge of slab.

2. Coat forms with form oil before concrete is placed to prevent adherence of concrete.

3. Leave forms in place not less than twenty-four (24) hours after concrete is placed.

4. Remove forms with care to prevent cracking, spalling, or overstressing concrete.

E. Sand used for fill under sidewalks shall be less than two inches (2") in depth. Depths greater than two inches (2") provide suitable material and compact.

F. Place and secure all-expansion joint material prior to concrete placement.

G. Concrete placement: uniformly moisten subgrade just prior to concrete placement.

H. Vibrate and consolidate to prevent formation of voids.

I. Screed concrete flush with forms; finish surface with wood or cork float .

J. Saw cut and seal joints in driveways as shown on Standard Drawings.

K. Edge sidewalk and mark off surface in square blocks.

L. Cure and protect driveways and sidewalks as specified for CONCRETE PAVEMENT.

M. Restrictions on operations for driveways and sidewalks as specified for CONCRETE PAVEMENT.

PART 8 - ASPHALTIC CEMENT CONCRETE PAVEMENT

INDEX

1. GENERAL

A. This part of the Specifications includes construction of full depth asphaltic cement concrete (ACC) pavement with non-integral portland cement concrete (PCC) curb and gutter.

2. MATERIALS

A. Asphaltic Cement: IDOT 2303.02A for mix design specified.

B. Tack Coat: SS-1, SS-1H, CSS-1 or CSS1-H; IDOT 2303.02A.

C. Aggregates

1. Type A Binder and Surface Course: one-half inch(½") mixture size; IDOT 2303.02B and IDOT 3203.02C.

   a. Surface course must have 50% of plus 4 sieve of Type 4 stone.

2. Type B Binder Course: one-half inch (½") mixture size; IDOT 2303.02B and IDOT 2303.02C, use only upon approval of Engineer.

3. Type B Class 1 Base Course: three-fourth inch (3/4") mixture size; IDOT 2303.02B and IDOT 2303.02C.

4. Tack Coats: IDOT 2303.02E.

D. Fabric Reinforcement: IDOT 2303.02D.

E. Reclaimed Material: IDOT 2303.02F.

PART 8 - ASPHALTIC CEMENT CONCRETE PAVEMENT

3. PROPORTIONS FOR MIX

A. Type A Binder and Surface Course: Basic asphalt content 6.00%; mix design to be performed by certified testing laboratory; IDOT 2303.02C.

B. Type B Binder Course: Basic asphalt content 6.00%; mix design to be performed by certified testing laboratory; IDOT 2303.02C.

C. Type B Base Course: Basic asphalt content 6.00%; mix design to be performed by certified testing laboratory; IDOT 2303.02C.

D. PAC-30 Admixture required on all surface courses on arterial streets.

4. STORAGE AND PROTECTION OF MATERIALS

A. Aggregate storage: Prevent contamination and intermingling; IDOT 2303.04A.

5. PAVING PLANT EQUIPMENT AND OPERATION

A. Paving Plant Equipment: IDOT 2001.

B. Paving Plant Operations: IDOT 2303.04.

6. PAVEMENT CONSTRUCTION

A. Trucks: IDOT 2001.03.

B. Placement equipment: IDOT 2303.05 and IDOT 2001.

C. Tack Coat: Place bitumen at 0.02 to 0.05 gallon/SY on horizontal surfaces, 0.10 to 0.15 gallon/SY on vertical surfaces; provide sand cover if required; IDOT 2303.17.

D. Handling and Delivering: ACC not to be placed when asphalt temperature is less than 245°F for lifts 1 ½" or less or 225°F for lifts in excess of 1 ½"; material delivery should be at a continuous uniform rate, do not incorporate cold segregated material; IDOT 2303.09.

E. Leveling Courses: Leveling courses to be used to fill depressions greater than one inch (1"); IDOT 2303.06.

F. Wedge Courses: Conform with general requirements of IDOT 2303.07.

G. Fixtures: Adjust all fixtures to final grade prior to placing surface course; IDOT 2303.14.

H. Fabric Reinforcement: Place as shown on plans; IDOT 2303.11.

I. Joints: Offset longitudinal joints between succeeding layers a minimum of three inches (3"), offset transverse joints between succeeding layers a minimum of six feet (6'); provide sawed vertical face at all transverse joints and when meeting existing pavements; IDOT 2303.13.

1. The use of wood or metal headers to form the edge of the joint during the rolling of the fresh mixture will not be permitted. The edges of all fixtures in the streets, edges or curbs, bridges or cold asphaltic concrete shall be tacked to facilitate a tight joint with the fresh mixture.

J. Base and Surface Courses: Conform with general requirements of IDOT 2303.08

1. Thickness of courses to be placed as shown on plans. After the base has been prepared and tack coated, the succeeding courses may be placed.

2. The surface of each layer shall be clean and free from foreign matter when each succeeding layer is placed. Any surface which becomes dirty shall be cleaned and if necessary the surface shall be primed to provide bond between succeeding courses.

3. When laying surfaces which require three or more adjacent passes of the finishing machine, the outer lanes shall be laid first and closure of the surface made by the interior strips near the center line.

4. Except for unavoidable delay or breakdown, the delivery of hot asphaltic concrete to any individual spreading unit shall be continuous and uniform at a rate sufficient to provide continuous operation of the spreading unit.

5. All handling and manipulation of the hot mixture from the mixer to the final placement on the road shall be so controlled that uniform composition is maintained and segregation of coarser particles is prevented.

6. Machine Spreading: On areas of uniform width the surface course shall be spread with a finishing machine. The spreading of surface courses shall be at such rate that when compacted the layer will be of the thickness and dimensions specified on the plans. Hand raking or disturbance of the layer spread by the machine shall be avoided.

K. Compaction: Conform with general requirements of IDOT 2303.12.

PART 8 - ASPHALTIC CEMENT CONCRETE PAVEMENT

1. Thoroughly compact asphaltic concrete while hot by rolling to specified density or tamping. All areas of binder or surface course inaccessible to the roller shall be thoroughly hand tamped while hot enough to compact properly.

   a. Marshall density obtained from approved testing lab for that day's run.

   b. Base Course: 94% laboratory density; less than 8% voids; IDOT Class C1 compaction.

   c. Surface Course: Minimum of 95% laboratory density, less than 8% voids; IDOT Class B1 compaction.

2. Initial rolling to be performed at such temperature that the mixture will compact without deleterious movement or distortion under the roller. Target temperatures are between 250° and 275°F. When a three-wheel roller is used, it shall be used for the initial rolling. When a three-axle tandem roller is used, it shall be used for the final rolling of the surface. The number of rollers shall be sufficient to compact the hot mixture as rapidly as it is laid. The initial contact with the hot mixture will be made by power or driving rolled. The rolling shall continue until the pavement has a density has been obtained.

L. Hand Work: When practical all wearing surface mixtures shall be spread by finishing machine. Irregular areas may be spread by hand methods. Do not dump truck loads of hot mixture directly upon the surface on which they will be spread. Loads may be dumped on metal pans or the material may be spread by hot shovels directly from the truck to the road surface. Spread hot mixture uniformly to the desired depth with shovels and rakes. Tines of the rake to be at least one-half inch (½") longer than the loose depth of the mixture. The hot mixture shall be carefully smoothed with a lute after spreading. The handles of the lutes shall be long enough to reach from the edge to the middle of the strip under construction. Loads shall not be dumped faster than they can be spread properly. Laborers shall not stand on the loose mixture while spreading; IDOT 2303.10.

M. Pavement Smoothness:

1. The surface courses shall be checked after the second rolling with a ten (10) foot straightedge placed parallel to the center line. Any variation greater than one-fourth inch (1/4") in the surface course shall be corrected. Prior to removal of bumps the surface shall first be warmed with a surface heater to soften the mixture until the surface can be loosened, and smoothed with rakes and straightedge. Do not burn asphalt, while still hot the mixture shall be rolled to obtain proper density; IDOT 2303.15.

2. Finished pavements on arterial and major collector streets to have a smoothness of 30 inches per mile or less when measured by a profilograph in accordance with IDOT 2316.01.B.

N. Fillets: Conform with general requirements of IDOT 2303.19.

7. MAINTENANCE OF BASE COURSE

A. Contractor responsible for maintenance of base course; IDOT 2303.22 and IDOT 2303.23.

B. Clean bituminous material from cracks one-half inch (½") or more in width; blow clean with compressed air and fill with a hot-poured joint filler from a pressure type nozzle; all cracks one-eighth inch (1/8"), or more, in width; remove all direct and debris which would interfere with placement of binder or surface course.

8. RESTRICTIONS ON OPERATIONS

A. Limitations: mixtures not to be placed on damp or frozen surfaces; IDOT 2303.18.

B. Temperature Restrictions:

1. Surface Courses: ambient temperature not less than 40°F and rising.

2. Base Courses: ambient temperature not less than 40°F and rising.

9. TESTING

A. Samples: All testing by approved testing laboratory; IDOT 2303.21.

1. Contractor shall cut samples from any course or from finished pavement not to exceed two (2) in number per 600 feet of lane for tests of density and composition. These samples shall be taken at points designated by the Engineer by drilling with a four inch (4") diameter core drill. The surfaces from which samples have been taken shall be restored by the Contractor on the next succeeding day of plant operation.

B. Area represented by each core is one-half (½) of distance to next core or to end of pavement.

C. Additional core samples may be made and measured at Contractor's expense to determine the extent and severity of pavement deficiency.

PART 8 - ASPHALTIC CEMENT CONCRETE PAVEMENT

10. DEFECTS OR DEFICIENCIES

A. Pavement containing excessive cracks, cold joints, deformities, or other defects shall be removed and replaced, or repaired, at no cost to City. Severity of defects and remedy determined by City Engineer.

1. When removals are required, remove all materials to the depth specified by the City Engineer. Sawcut vertical edges to depths specified.

2. Partial depth patches: In areas where bituminous material is removed for a depth greater than one inch but less than the total thickness of the pavement, the depressions shall be given a tack coat and filled with hot asphaltic concrete mixture to be deposited in layers not exceeding three inches (3") compacted thickness. Thoroughly compact while hot by rolling with an adequately weighted pneumatic tire or by tamping with a mechanical tamper until it has attained a density satisfactory to the Engineer. Succeeding layers may be placed as soon as the preceding layer has been properly compacted. The final compacted surface shall be level with, or not in excess of approximately one-fourth inch (1/4") above, the surrounding surface.

   a. Depressions less than one-half inch (½"): The surface shall also be first heated with surface heaters, then loosened and covered with hot, fresh, mixture from which the coarse particles have been removed and raked to the proper elevation and rolled to proper density.

   b. Depressions of one-half inch (½") or greater: The surface course over the entire area below the required elevation for the pavement surface shall be removed and replaced with fresh mixture, smoothed and compacted in layers to the density required to provide a surface at the correct elevation.

3. Full depth patches:

   a. Fill material which is used to adjust the subgrade elevation to be approved by the Engineer and compacted by rolling or by tamping with a mechanical tamper. The surface of the subgrade and edges of the old pavement shall be lightly tacked.

   b. The asphaltic concrete patch mixture to be deposited in layers not to exceed six inches (6") in compacted thickness. Each layer shall be thoroughly compacted while hot, by rolling or by tamping with mechanical tampers until it has attained a density satisfactory to the Engineer. Succeeding layers may be placed as soon as the preceding layer has been properly compacted. The final compacted surface shall be level with, or not more than approximately one-fourth inch (1/4") above, the surrounding concrete.

4. Opening to traffic: Patches shall not be opened to traffic until the mixture has cooled sufficiently to provide stability. If the bituminous coating has not set sufficiently when the surface is opened to traffic, the Engineer may require the surface to be lightly sanded in order to prevent traffic from picking up the coating.

B. If the concrete cores taken are less than the specified thickness, remove and replace pavement or mill surface a normal one and one-half inch (1 ½") in depth and replace surface course. Deficient thickness pavement will not be accepted.

PART 9 - SURFACE RESTORATION

INDEX

1. GENERAL

A. The work under these Specifications include incidental grading, preparation of seedbed, fertilization, planting of seed, mulching, sodding, and watering of sod.

B. Seeding Dates: Spring seeding dates shall be between March 1st and May 30th. Fall seeding dates shall be between August 10th and September 30th. Legumes shall only be seeded during Spring planting season before April 15th.

C. The Contractor and Subdivider are responsible for complying with all Local, State, and Federal regulations regarding erosion control and clean water regulations.

D. Restore parking areas in existing right-of-way to similar or better condition than existed prior to construction.

1. Sod all areas disturbed in manicured yards.

2. Seed all other areas.

2. GRADING

A. Erosion & Drainage: The Contractor shall be responsible for incidental grading on site to eliminate erosion gullies and ruts, and shall provide proper cross section for drainage as directed by City Engineer.

B. Fill Material: If extra earthwork fill is needed, the Contractor shall provide fill to conform to lines and grades as shown on plans.

3. PREPARATION OF SEED-BED

A. Areas Accessible to Machinery: Areas accessible to field machinery shall be thoroughly worked to a depth of not less than three inches (3"). The soil shall be brought to a loose, friable condition, and shall be picked free of rocks and concrete chunks in excess of one inch

(1") diameter where weed growth has developed extensively, the use of a disk will be allowed to disk these weeds into the ground if the weeds can be completely covered by this method.

B. Areas Inaccessible to Machinery: Areas inaccessible to field machinery shall be prepared by hand to a depth of not less than one and one-half inches (1-1/2"). The soil shall be brought to a loose friable condition.

C. The seedbed shall be inspected and approved by the City Engineer prior to seeding.

4. FERTILIZER

A. Quality of Fertilizer: Fertilizer shall be granular type and shall be delivered to site in the original bag in good condition for proper distribution.

B. Rate of Fertilizer: Fertilizer shall be spread uniformly at a rate of 650 pounds per acre of 15-15-15 commercial fertilizer or equivalent per acre. All areas seeded shall be fertilized.

C. Fertilize all areas to be seeded or sodded.

5. SEEDING

A. Lawn Seed Mixture: Unless otherwise specified the recommended lawn seed mixture shall be the following:

Creeping Red Fescue	22 lbs. per acre
Kentucky Blue Grass	44 lbs. per acre
Perennial Rye Grass	7 lbs. per acre

B. Temporary Seed Mixture: Apply as soon as practical following grading operation. The following seed mixture shall be used:

Oats	20 lbs. per acre
Rye Grass - Annual	15 lbs. per acre
Rye Grass - Perennial	15 lbs. per acre
Fescue - Kentucky - 31	10 lbs. per acre

C. Special Seed-Steep Slopes:

1. Crownvetch: Where specified on steep slopes the following seed mixture shall be used:

Crownvetch	10 lbs. per acre
Creeping Red Fescue	5 lbs. per acre

Alfalfa (Northern Grown)	5 lbs. per acre
Birdsfoot Trefoil (Empire)	5 lbs. per acre
Annual Rye Grass	5 lbs. per acre

2. Inoculation: All Crownvetch seed shall be inoculated with the type specified for crownvetch. Inoculated seed shall not be exposed to direct sunlight for a period of time exceeding one half (½) hour. Seed which is not sown within eight (8) hours after inoculation shall be reinoculated prior to use. Crownvetch and Birdsfoot Trefoil shall be inoculated at five (5) times the rate specified by the manufacturer of the inoculate. All other legumes shall be inoculated at two (2) times the rate specified by the manufacturer of the inoculate.

3. Special Handling: All Crownvetch seed shall be treated with a non-mercurial fungicide seventy-five percent (75%) concentration or equivalent at the rate of one (1) per one hundred (100) pounds of seed. All crownvetch seed shall be treated with an approved sticking agent to be applied prior to application of the inoculate and fungicide.

4. Time of Application: Crownvetch seed shall be applied only in the Spring. The crownvetch seeding shall be considered the final operation of seeding, fertilizing and mulching. Crownvetch shall be applied within twenty-four (24) hours after completion and mulching operation.

D. Method of Seeding: on areas accessible to field machinery, all grasses and legume seed shall be sown with a broadcast seeder or hydraulic seeder on areas inaccessible to field machinery, use or hand-cyclone seeders will be permitted.

E. Covering and Compaction of Grasses and Legumes: sowing of grasses and legumes shall be followed by not less than one (1) complete rolling with a cultipacker or approved equipment. Where the compaction equipment will not operate satisfactorily, the seeded area shall be lightly dragged or raked in by hand.

F. Guarantee: if less than fifty percent (50%) of seed fails to become established and survive to the next season in any given area three (3) square feet or larger, the Contractor shall be responsible for preparing the seed bed as specified in Section 3 and overseeding at the rate specified in Section 5A.

6. MULCHING

A. Mulch all seeded areas as soon as seed is applied.

B. Material & Rate: Mulch material shall be oat straw or equivalent, applied at a rate of two (2) tons per acre.

C. Application of Mulch: With exception to Crownvetch, the mulching shall be the final operation of seeding. The mulch shall be evenly and uniformly distributed and anchored into the soil. Anchor mulch into soil by means of dull blades or disc.

7. SODDING

A. Material: Sod material shall be a good commercial grade of sod, predominantly containing Kentucky Blue Grass and Fescue. The sod shall be free of noxious and other weeds.

B. Preparation of Sodbed: The sodbed shall be prepared in accordance with SECTION 2 of this Specification. In addition, the grade at sidewalks and driveways shall be lowered such that the final grade of the sod does not protrude above the concrete surfaces. The sod shall be blended to natural ground lines to promote drainage.

C. Watering Sod: The sod shall be watered within one (1) hour after placement and shall receive enough water to thoroughly soak sod plus sodbed. Sod shall thereinafter be watered every other day for at least a two (2) week period.

D. Guarantee: If fifty percent (50%) of sod fails to survive until next seeding season, the Contractor shall be responsible for resodding or overseeding with the specified lawn seed mixture.

8. PAVEMENT REPLACEMENT

A. This section describes work to replace existing pavement removed or damaged during construction; comply with applicable requirements of Concrete Pavement; equal or exceed the before construction condition and City Standards.

B. Saw cut edges of removal with saw, concrete cutter, or other equipment which will produce vertical edge; cut pavement full depth.

C. Break up and remove existing concrete or asphalt pavement through use of pneumatic hammer or other suitable equipment; do not damage remaining pavement; remove pavement to existing joint when required to maintain joint spacing greater than two feet (2') and when required by City Engineer.

D. Provide temporary granular surfacing on streets and driveways immediately following completion of backfill.

1. Should weather condition or traffic preclude the option of immediately installing the permanent repairs, temporary measures may be taken upon approval of the City Engineer.

E. Install and maintain dust abatement control measures until surface replacement is complete.

F. Temporary granular surfacing is incidental to construction.

G. Granular Surfacing: replace or supplement existing granular surfacing as shown on plans and as directed by City Engineer; place, compact, and grade granular surfacing to drain; minimum thickness of gravel surfacing restoration: six inches (6"); supplement displaced surfacing to bring surface to grade; maintain dust abatement control measures until construction is completed and accepted.

H. Concrete Pavement: remove existing concrete pavement full depth and replace with concrete pavement thickness one inch (1") greater than existing.

I. When new concrete pavement is constructed adjacent to existing concrete pavement install "BD" joint.

J. Concrete Curb and Gutter: remove existing concrete curb and gutter and replace with new concrete curb and gutter to thickness shown on Standard Drawings; construct new curb to uniform cross section matching existing curb; depress curb at pedestrian curb ramp as shown.

K. Concrete Driveway removal and replacement: remove existing driveways and replace with new concrete driveways as shown on Standard Drawings and as directed by City Engineer; score or sawcut driveway to match existing driveway; protect from traffic for seven (7) days after the concrete is placed.

L. Concrete Sidewalk removal and replacement: remove existing sidewalk and replace with new concrete sidewalk as shown on Standard Drawings and as directed by City Engineer; score sidewalk to match existing sidewalk in sections not less than nine (9) nor more than thirty six square feet (36 sq. ft.) in area; construct expansion joints where sidewalk meets other sidewalk, curb, or fixtures in the surface; construct expansion joint by installing a one-half inch (½"), full depth of approved premolded joint material.

M. Asphalt Pavement: remove existing asphaltic concrete pavement full depth and replace with new asphaltic concrete material and compact as shown on plans and as directed by City Engineer; use asphaltic concrete only to match existing material and only where allowed by City Engineer.

1. Asphalt pavement (ACC): use commercially available asphaltic concrete plant mixture; one-half (½) mixture size equivalent to Iowa DOT Type A Surface Mixture; submit current laboratory test data; mix design subject to approval of City Engineer.

2. Clean and apply tack coat to edges of existing pavement and adjacent one foot (1') of subgrade; tack coat bitumen: SS-1, SS-1H, CSS-1, CSS-1H; IDOT 2303.02A.

3. Place asphaltic concrete mixture in layers with the upper five inches (5") in at least two (2) layers; minimum temperature of mixture during placement: two hundred and forty-five degrees Fahrenheit (245° F.)

4. Compact each layer thoroughly with vibratory compactor; final patch shall have smooth riding surface and be level with or not more than one-eighth inch (1/8") above adjacent pavement.

5. Allow mixture to cool sufficiently to provide stability prior to opening to traffic; schedule work for removal of barricades at end of each working day.

PART 10 - GABIONS

INDEX

1. GENERAL

A. This part of the Specifications includes materials, bedding, backfill, assembly, and installation for construction of gabion channel lining and gabion retaining walls.

2. MATERIALS

A. Baskets: Rectangular baskets; hexagonal triple twist steel wiremesh; galvanized steel wire; zinc coating; FS QQ-W-46lg being eleven and one-fourth (11-1/4) gauge mesh and nine (9) gauge selvage rod. Approved brands are Bekaert, Maccaretti, or approved equal.

B. Lacing Wire: thirteen (13) gauge galvanized steel wire; minimum galvanized coating 0.80 ounces per square foot.

C. Diaphragms: Vertical diaphragm conforming to requirements of basket wire; place on three foot (3') centers, attach to base of baskets.

D. Connecting Wire: As per manufacturer's specification and recommendations; use on three foot (3') deep baskets.

E. Fill Stone:

1. Class A quality stone conforming to IDOT; sieved, well-graded broken limestone, dolomite or quartzite; size four inches (4") to eight inches (8"); maximum per cent passing No. 4 sieve: ten percent (10%) maximum-percent wear in accordance with AASHTO T-96: forty-five (45%).

2. Maximum percent loss by weight after twenty-five (25) cycles of freezing and thawing: ten percent (10%).

3. Materials shall meet durability requirements of IDOT for use as aggregate in concrete.

F. Filter Fabric: Non-woven material; IDOT approved for subsurface drainage.

G. Porous Backfill: Well-graded limestone, gravel not exceeding two inches (2") in diameter.

Part 10 - GABIONS

3. BEDDING AND BACKFILL

A. Bedding:

1. Provide firm unyielding foundation for placement of gabion.

2. If unsuitable foundation exists, remove and replace with suitable materials and compact to not less than ninety-five per cent (95%) maximum density.

B. Backfill:

1. Place and compact porous backfill and earth backfill as shown on plans to not less than ninety-five per cent (95%) maximum density.

C. Filter Fabric:

1. Overlap filter fabric joints six inches (6") minimum; use where shown on plans.

4. ASSEMBLY AND INSTALLATION

A. Assemble, install, and erect gabions in accordance with manufacturer's instructions and recommendations.

B. Assembly:

1. Unfold gabion, flatten all kinks and bends.

2. Erect sides, ends and diaphragms, creases in proper position and all tops of sides level.

3. Lace four corners of gabion, followed by edges of internal diaphragms.

4. Lace gabion with alternating single and double loops no more than six inches (6") apart.

5. Modify above procedures in accordance with instructions provided by manufacturer and approved by City Engineer.

C. Installation:

1. Place assembled gabion units in their proper location.

2. Lace empty gabions together.

3. Fill baskets by methods recommended by manufacturer. Maintain rectangular pattern as basket is filled.

4. Place outer layer of fill stone by hand to provide a square appearance. For retaining walls place larger stone to simulate natural occurring ledge rock.

5. Gabion structures requiring more than one tier shall be laced to the lower one and lapped so end joints do not coincide.

6. Close and lace gabion basket lids by methods recommended by manufacturer. Maintain level top to provide even surface for next course.

7. Place porous backfill and earth backfill as shown on plans.

8. Modify above procedures in accordance with instructions provided by manufacturer and approved by City Engineer.